

OCR A Level

Computer
Science

H446 – Paper 1

4

Input devices

Unit 1

Components of a
computer and their
uses



PG ONLINE

Objectives

- Describe different input devices
- Explain how different input devices can be applied as a solution to different problems

Manual input devices

- All input devices transfer data from the source in the outside world to the computer
- Some input devices require greater human intervention than scanners or cameras to generate the data. These include:
 - Keyboards and keypads
 - Pointing devices
 - Microphones
 - Touch screens
 - Interactive Whiteboards

Keyboards and keypads

- Think of some uses of a keyboard or keypad
 - Where are specialist keypads used?



Pointing devices

- Most common examples are the mouse and the trackerball
 - Trackerballs have a ball on the top of the device which is moved by the user
 - The actual device itself remains stationary, thus requiring less desk space

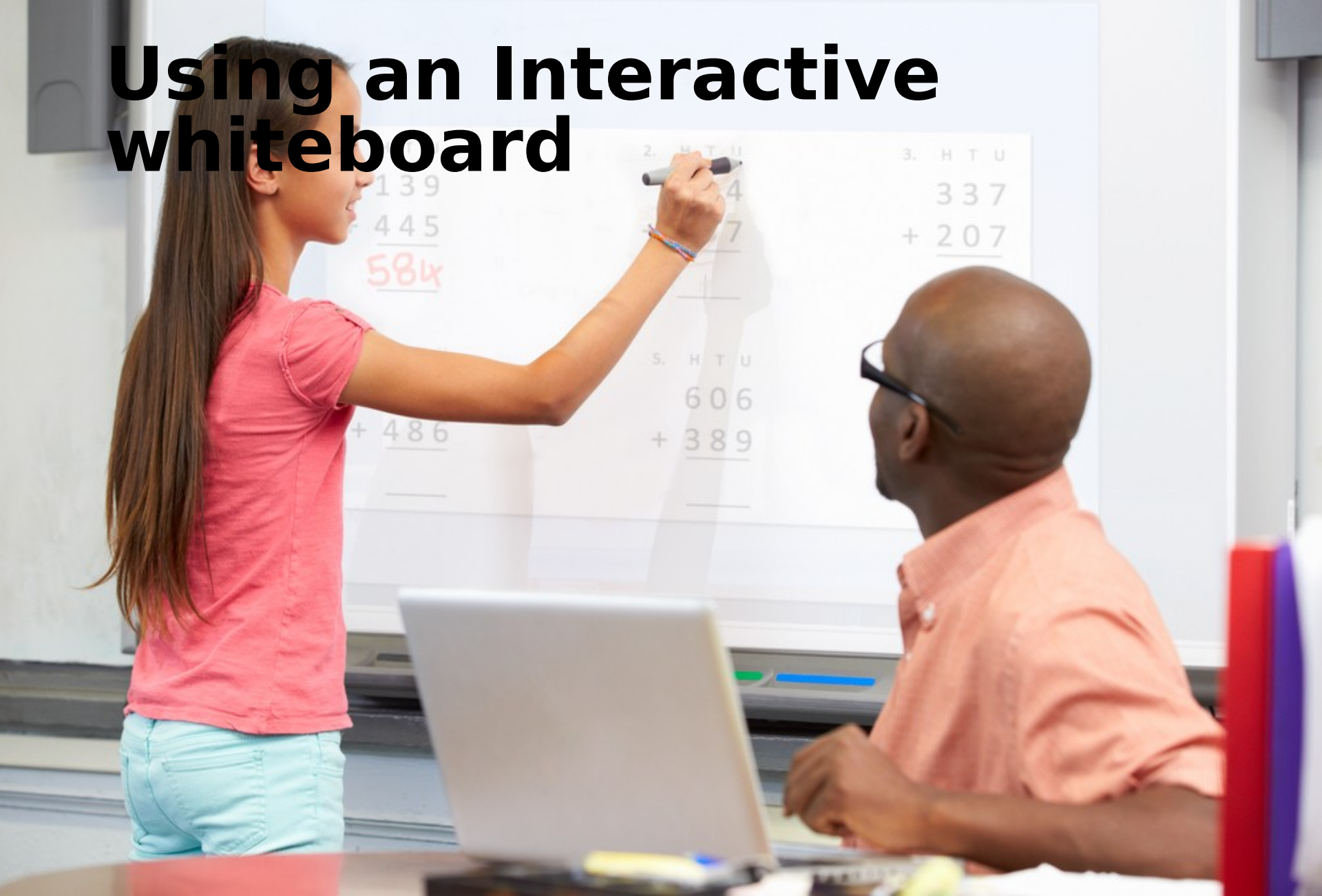


Touchscreens

- Touchscreen technologies are used with tablets, watches and mobile phones



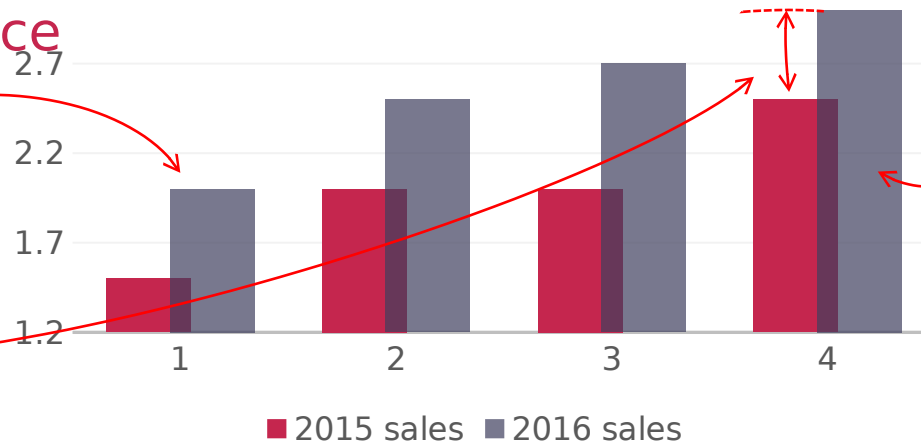
Using an Interactive whiteboard



Interactive whiteboards

- Interactive whiteboards are used to show audiences at meetings or classroom students, computer output
 - They allow the user to use the board as a touchscreen or write over the screen to create annotations
 - At the end of the meeting, hand annotations can be saved along with the screen image for future

Sales are up by 30% in first quarter but improvement seems to tail off later in the year



Not sure if this is the best type of chart to show the sales figures



Worksheet 4

- Now complete **Tasks 1** and **2** on **Worksheet 4**



Barcode readers

- Two common types of barcode system:

- **Universal Product Code version (UPC-A)**

- Used in **retail** and **warehousing**



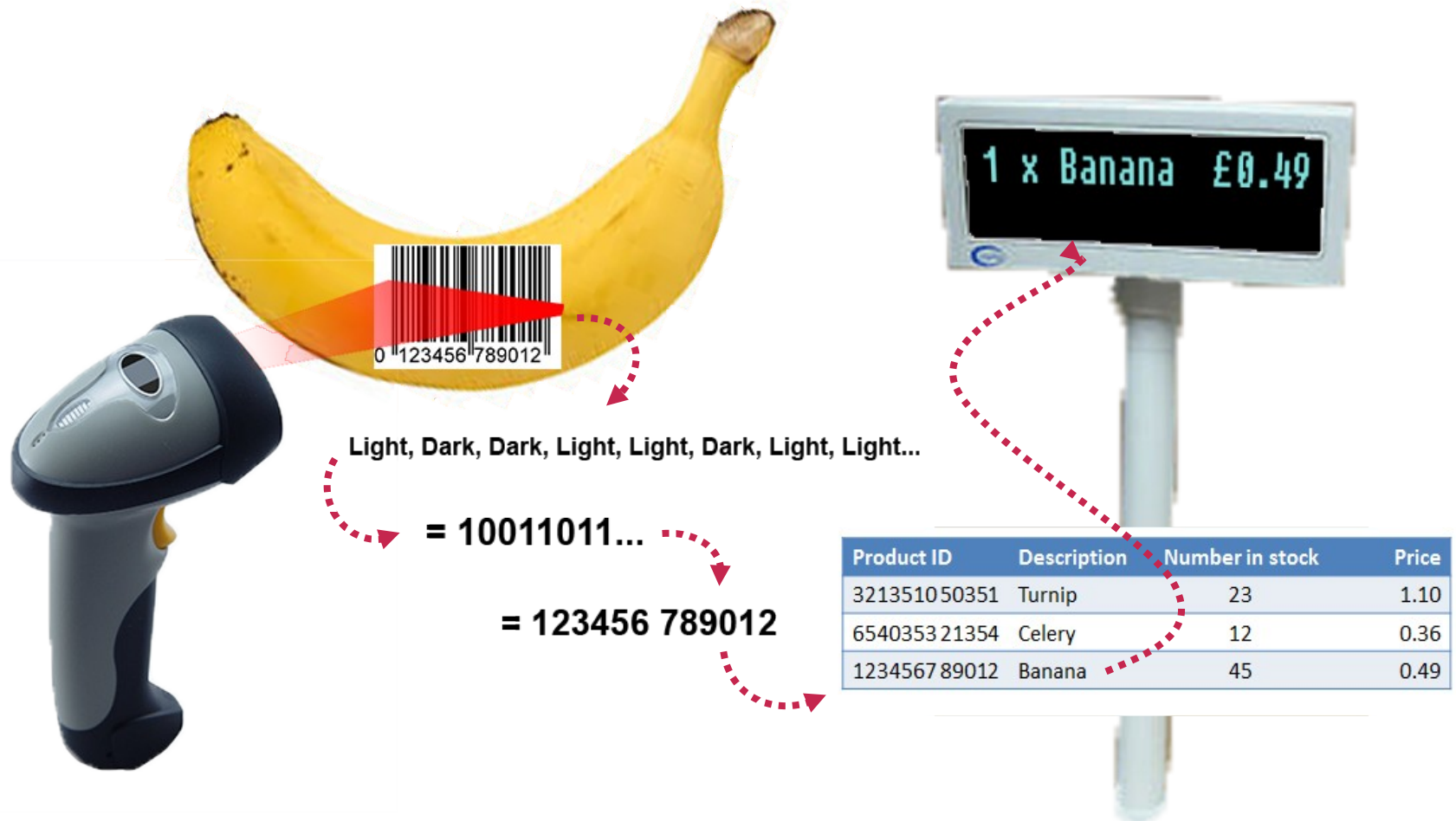
- **Code 128**

- Used in **transport** and **shipment tracking**



- Code 128 can represent letters and numbers whilst UPC-A can only represent numeric digits

Barcode readers



Response) Quick

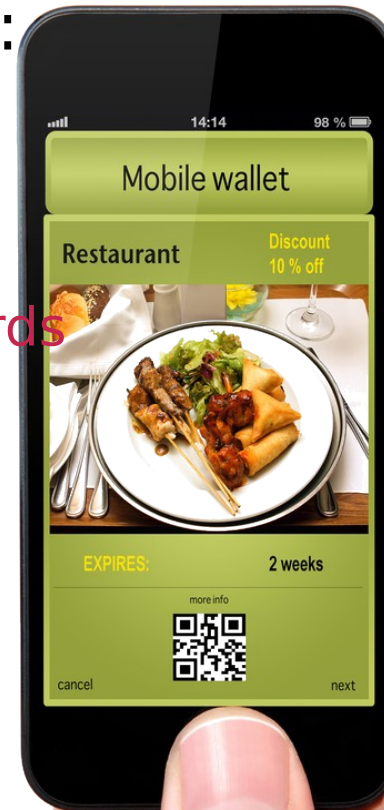
- QR codes are 2D barcodes and can be read by smartphones or tablets
- They can contain:
 - Links to websites or
 - Information
- Try scanning these codes as examples:



Uses of QR codes in society

Common uses include:

- Restaurant coupons
- Mobile concert tickets
- Real estate agency boards
- Business cards
- Tourist information
- Advertising posters

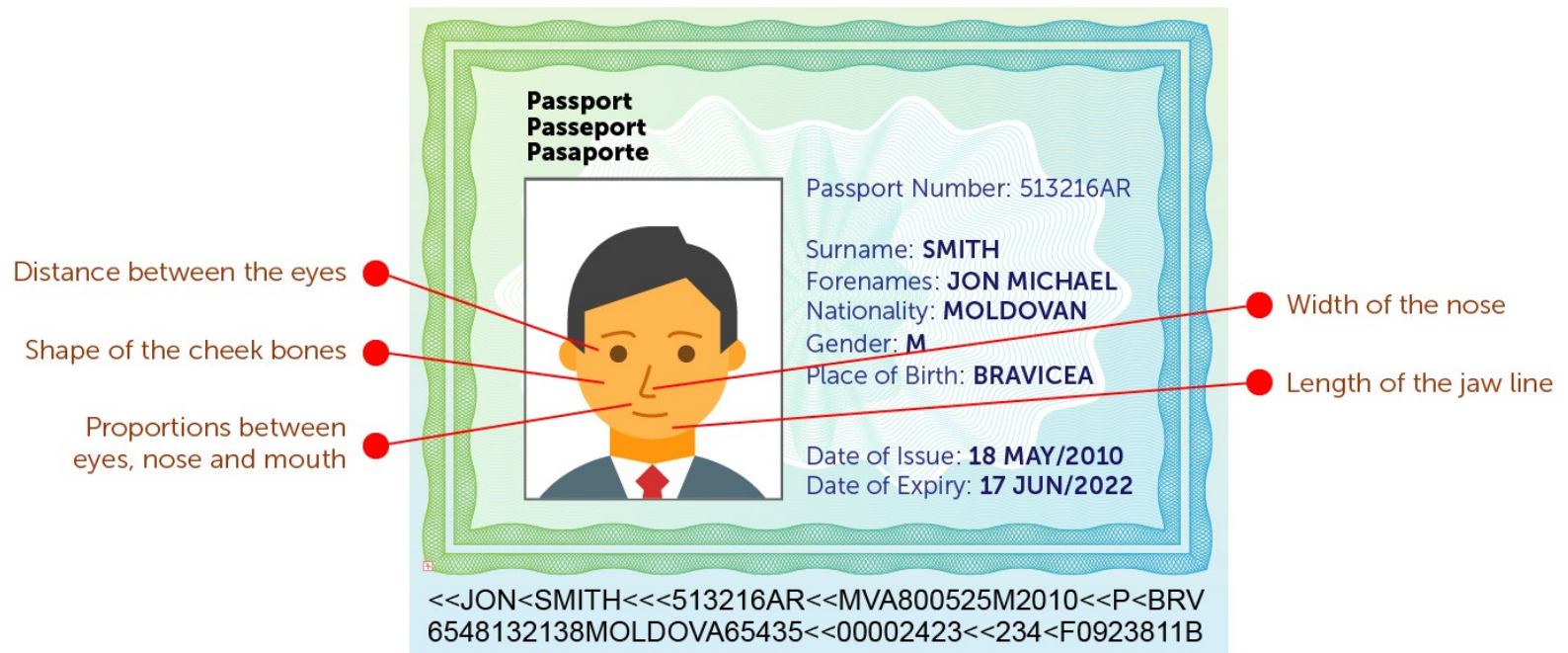


2D scanners

- These are used to convert a hard/paper copy document or photograph into a computer-readable format
- Useful for emailing hand-drawn images or text to someone else
 - For what other reasons might you use a document scanner?

3-D face recognition

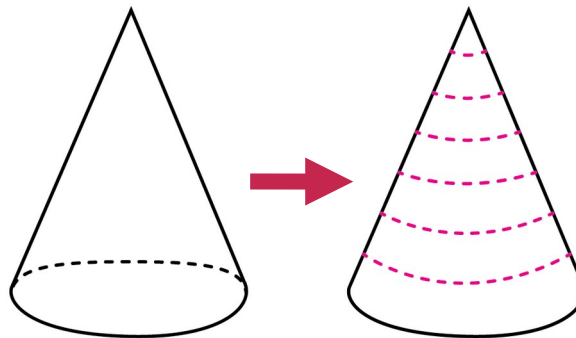
- Security cameras may use face recognition
 - Specialist software measures and compares the proportions of a person's face with those stored



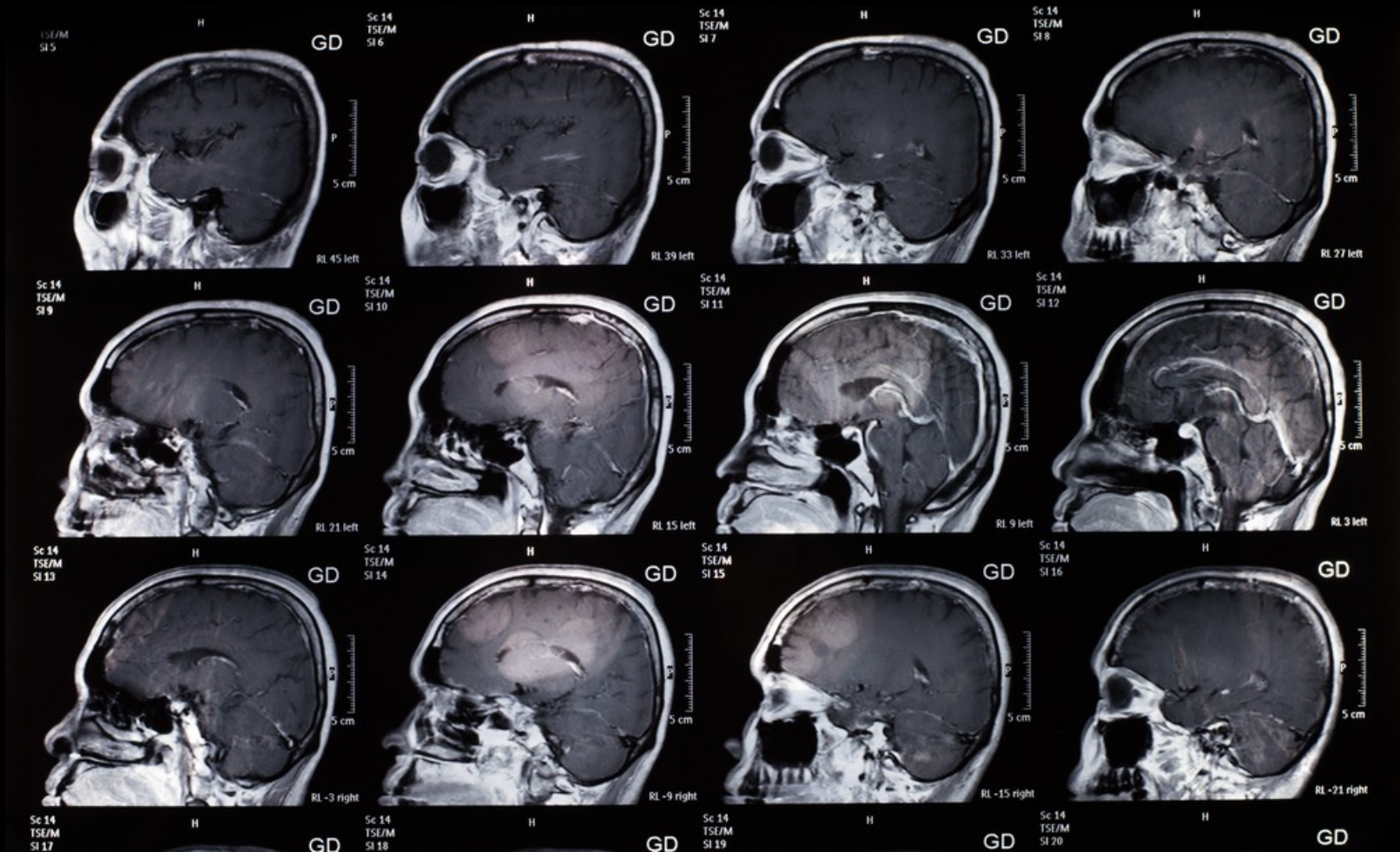
3D scanners

- 3D scanners are used in both industrial and medical fields
- Many 3D scanners rely on a technology called **Tomography** which basically means to image something in very thin slices (less than 0.1 mm thick)

- Here a solid cone has been sliced up into several thin slices which will be scanned and then again form the original cone



3D MRI scanning



Sensors

- Some data can be obtained directly through the use of sensors
- Sensors often collect data in an analogue form and require conversion to digital data to be processed
 - Sensors are used in both monitoring and control applications



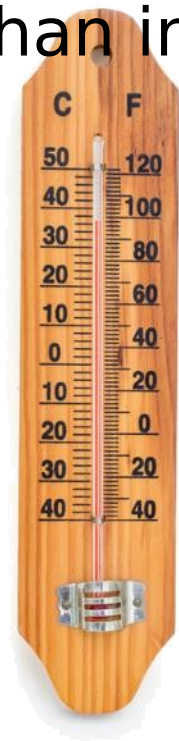
Sensors

- The definition of a sensor is:
 - ‘A hardware device that can take measurement of physical properties, such as temperature or pressure, from real world surroundings. These measurements are usually a representation of the actual property being measured.’
- Data taken by sensors is usually in analogue form



Analogue measurements

- Analogue means that data has no discrete value and the data changes smoothly rather than in exact jumps
- Examples include:
 - A thermometer where temperature is represented by the height of the mercury
 - A speedometer showing speed represented by a needle on a gauge
 - A seismometer recording the force and duration of ground movement by visualising the motion of a weight on a string using a pen



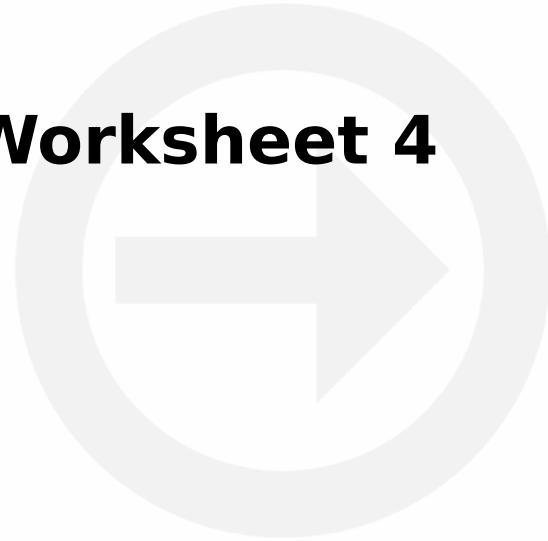
Types of sensor

- There are many types of sensor designed to carry out specific tasks. These include:
 - Gas (e.g. oxygen, carbon dioxide)
 - Infra-red (e.g. motion or heat source)
 - Light
 - Temperature
 - Pressure
 - pH (i.e. acid or alkalinity)
 - Magnetic field
 - Moisture/humidity
 - Acoustic (i.e. sound)



Worksheet 4

- Now complete **Task 3** on **Worksheet 4**



Types of sensor

Type of sensor	Applications
Temperature	<ul style="list-style-type: none">• control the central heating system in a house• control or monitor the heat output in a chemical process• control or monitor the environmental temperature in a greenhouse
Moisture/humidity	<ul style="list-style-type: none">• control or monitor the dampness of soil in a greenhouse• control or monitor the dampness of the air in a greenhouse• monitor the dampness levels in a factory making microchips
Light	<ul style="list-style-type: none">• switch street lighting on at dusk and switch street lighting off at dawn• automatically switch a car's headlights on when it gets dark• to close or open the window blinds in a greenhouse to maintain light levels
Infra-red	<ul style="list-style-type: none">• turn on a car's windscreen wipers automatically when it starts to rain• detection of intruders in a burglar alarm system• count the number of people entering or leaving a supermarket
Pressure	<ul style="list-style-type: none">• detection of intruders in a burglar alarm system• checking the weight of a vehicle on a weigh bridge• measurement of air pressure to forecast weather
Acoustic	<ul style="list-style-type: none">• pick up noise levels (e.g. footsteps) in a burglar alarm system• detect the noise of liquids dripping from a pipe in an oil refinery• monitor the sound levels in a car factory
Gas	<ul style="list-style-type: none">• monitor CO₂/O₂ levels in a river• monitor CO₂/O₂ levels in the air in a greenhouse• check for the carbon monoxide levels in a car exhaust system
pH	<ul style="list-style-type: none">• monitor or control the acidity levels in a chemical process• measurement of pollution levels in a river• check acidity levels in the soil in a greenhouse
Magnetic field	<ul style="list-style-type: none">• used in smart phones so they know which direction it is pointing• used in the motors of CD players• used in vehicle anti-lock braking systems

Monitoring and control

- Monitoring:
 - With these applications, the computer or microprocessor will make no changes to the actual process; it will simply report the values
- Control
 - The output from the computer or microprocessor can alter how the process is operating;
 - it can change the value of the next input received by, for example, opening a valve, switching off a heater or changing the speed of a pump
 - the output from the computer or micro processor can affect the next input it receives

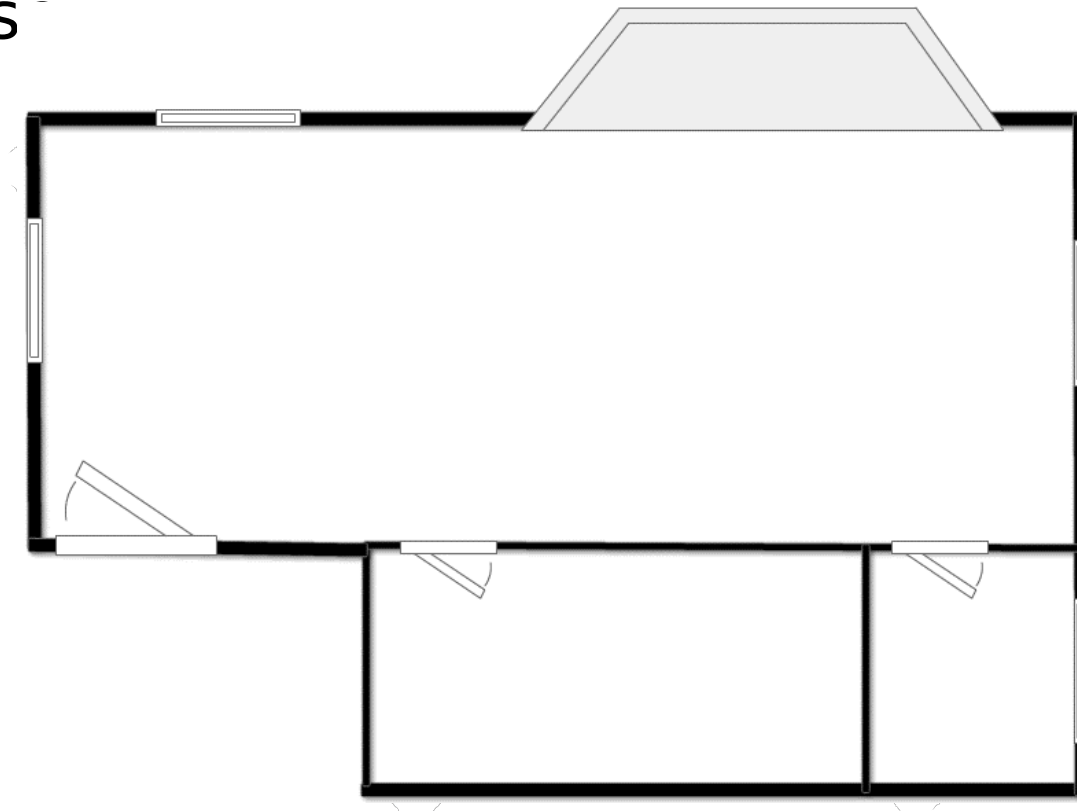
Detection systems

- The **pressure sensors** monitor an intruder stepping on the floor next to the windows, doors or on the floor next to valuable paintings
- The **acoustic sensors** pick up the sound of breaking glass or footsteps on the floor
- The **infra-red sensors** pick up movement in the rooms but also any changes in heat (e.g. heat radiation from an intruder)



Monitoring systems

- This example of monitoring involves an intruder detection and alarm system in a house



How does it work?

- The system is first activated by the user keying in a PIN code or by placing an alarm fob near a receiver
 - Sensors constantly monitor the rooms for intruders
 - Data is converted into digital form using an ADC and is sent to a microprocessor



Sensor feedback

- Sensors constantly take readings for monitoring
 - If any of the sensor readings exceed the pre-set values, then the microprocessor sends a signal to warn the user (this could be a screen output, a siren or flashing light or all three)
 - Each sensor will feed into an interface box so that the microprocessor can pin-point exactly which sensor sent the high value
 - Monitoring continues until the user keys in a PIN/passcode to deactivate the system

Monitoring systems

- Now complete **Tasks 4 and 5** on **Worksheet 4**
 - This task asks you to describe how sensors and a computer can be used to monitor the pollution levels in a river, at a number of points, over a period of time



Examples of monitoring and control

Application	Monitoring	Control
Automatically turning street lights on at night and off during the day		
Changing the traffic lights at a junction to control the traffic flow		
Keeping track of a patient's vital signs (e.g. heart rate, temperature) in a hospital		
Regulating the temperature in an air conditioning system		
Checking for intruders in a burglar alarm system		
Keeping track of the pollution levels in a river		
Ensuring that the anti-lock braking system in a car works effectively		



Examples of monitoring and control

Application	Monitoring	Control
Automatically turning street lights on at night and off during the day		<input type="checkbox"/>
Changing the traffic lights at a junction to control the traffic flow		<input type="checkbox"/>
Keeping track of a patient's vital signs (e.g. heart rate, temperature) in a hospital	<input type="checkbox"/>	
Regulating the temperature in an air conditioning system		<input type="checkbox"/>
Checking for intruders in a burglar alarm system	<input type="checkbox"/>	
Keeping track of the pollution levels in a river	<input type="checkbox"/>	
Ensuring that the anti-lock braking system in a car works effectively		<input type="checkbox"/>



Pollution levels in a river

- Monitoring processes:
 - Sensors constantly send data to computer via an interface box
 - Data is converted into digital form at the control room before being analysed by computer using an ADC
 - The computer checks oxygen levels against pre-set values
 - If oxygen levels **<15%** then the computer warns operators in control room
 - Computer checks pH levels against set values and if **pH <6** or **pH >8**, then computer warns operators in control room
 - monitoring continues until system switched off



Worksheet 4

- Complete **Task 6** of **Worksheet 4**



Plenary

- The emphasis in this course is on describing how different I/O devices can be applied as a solution to different problems
- For example:
 - “Explain how the system used in a supermarket can control the quantity of tins of beans in stock so that the chance of running out is minimised.” (6 marks)

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